

Rheumatic Fever in College Students

ALFRED F. GOGGIO, M.D., Berkeley

THE INCIDENCE of rheumatic fever and rheumatic heart disease in any population is a matter of some practical importance, particularly so now that methods of prevention and of continued prophylaxis against further attacks of the disease are being so widely stressed. Accurate statistical studies are rare. The author has previously presented studies on the incidence of rheumatic fever and rheumatic heart disease in one large although admittedly select segment of the population—college students.^{1,2} It is the purpose of this report to present briefly the results of two new surveys dealing with the incidence of rheumatic fever and of rheumatic heart disease and to compare the findings with those of the previously reported survey. All three surveys were done at the University of California, Berkeley campus. They were done, however, at different times, by different methods, on entirely different groups of students, and completely without inter-reference one to the other.

Student population survey of 1954

Every student upon registration at the University of California in Berkeley is "health processed" through the Student Health Service situated in the Ernest V. Cowell Memorial Hospital. At the time of processing, each student is given a health record card upon which he or she fills in certain requested pertinent information, including the age at which he or she had certain specified diseases and symptomatologic entities, of which rheumatic fever was one. Each student is given a complete physical examination and photofluorogram of the chest and the results are recorded in detail on the same health record card. This health record card is kept on file by the Student Health Service and it is used as a record of all visits and illnesses of that student throughout his stay in the University.

In the spring of 1954 the entire student population of the Berkeley campus, 14,898 persons, was surveyed in a mass photofluorographic study that was conducted by the Department of Biostatistics in cooperation with the Ernest V. Cowell Memorial Hospital and the United States Public Health Service. In addition to the photofluorographic aspect, and because of the availability of considerable data, one of the objects of the study was to obtain cer-

• The results of three independent surveys concerned with rheumatic fever and heart disease in students at the University of California were assembled and found to be in close agreement. A full 2 per cent of all students believed they had had rheumatic fever; and several times that proportion gave a history of one of the rheumatic manifestations. Only 0.25 per cent had demonstrable rheumatic heart disease and 0.1 per cent had congenital heart disease.

Physiologic murmurs may occur in 3 per cent or more of students entering college.

Penicillin prophylaxis is important in persons with rheumatic heart disease, but it is important not to put a label of rheumatic heart disease on persons who think they have had rheumatic fever but who have no demonstrable heart disease. Long term penicillin prophylaxis or other long term prophylactic procedures directed against rheumatic fever are not indicated unless the diagnostic criteria for rheumatic fever are clearly met or unless rheumatic heart involvement is definitely present.

tain descriptive information about the student population. The student's health record card was one of the documents that was reviewed and coded for this purpose.

A history of rheumatic fever was one of the items on the health record card of all students that was examined and coded for a positive answer. It was found that there were 259 persons in the total registration of 14,898 who had indicated on their card that they had had rheumatic fever. Hence the incidence of rheumatic fever as given by the student himself in this survey was 1.74 per cent.

Survey in conjunction with the Division of Special Services of the Department of Health, Education, and Welfare, 1956-1957

In the course of the past two years or more, the Division of Special Health Services of the Department of Health, Education, and Welfare has been collecting data from more than 65 colleges and universities in the United States relating to rheumatic fever and rheumatic heart disease. The University of California, Berkeley campus, was one of the participating colleges in this study. This survey was confined to entering freshmen of both sexes.

In the conduct of this survey, each entering freshman at the time of processing by the Student Health

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Service was given (in addition to the previously mentioned health record card) a questionnaire form provided by the Division of Special Health Services upon which several questions were to be answered by the student: 1. "Have you ever had (A) inflammatory rheumatism, (B) scarlet fever, (C) Saint Vitus' dance (chorea), (D) joint pains and swelling, (E) leakage of the heart valve(s) (heart murmur)?" Each question was to be answered by checking either "no" or "yes" or "don't know." 2. "Have you ever been told by a physician you had rheumatic fever?" Again the answer to be indicated by checking "no," "yes" or "don't know." (There were additional questions on the form but they were not pertinent to the present review.) All the questionnaire forms were reviewed by the college physician.

In the survey here reported as carried out at the University of California, Berkeley campus, whenever the answer to any of these questions was "yes" or "don't know," the cardiologist checked the questionnaire against the student's health record card and recalled the student for further questioning and re-examination in order to evaluate the reliability of the history and to establish a definite diagnosis wherever possible. Also re-examined by the cardiologist were all students in the same entering freshmen groups in which a history of rheumatic fever was otherwise obtained or in which the possibility of heart disease was found in the course of the entrance physical examination. Electrocardiograms and cardiac x-ray studies were done in all cases in which there appeared to be possibility of heart disease. The cardiologist attempted to reach a definite diagnosis in all cases, applying closely the Criteria for Diagnosis of Diseases of the Heart adopted by the American Heart Association.

Included in this survey at the University of California, Berkeley campus, were all entering freshmen for the year 1956-57. The total number was 2,259, of whom 1,150 (50.9 per cent) were males and 1,109 (49.1 per cent) were females. Racially the population consisted of 1,199 (90.6 per cent) whites, 156 (7.1 per cent) Oriental and 41 (1.9 per cent) Negro. In Table 1 the answers to Question No. 1 are presented to show the historical incidence of each of the five conditions listed and also the relationship of each condition to a concomitant history of rheumatic fever as obtained from positive answers to Question No. 2. In answer to Question No. 1 of the questionnaire, 219 (9.7 per cent) different students said they had had at least one of the five conditions listed. As to Question No. 2, "Have you ever been told by a physician that you had rheumatic fever?" 45 of the 2,259 answered affirmatively. Thus the incidence of rheumatic fever based on the student's knowledge of having been told he

TABLE 1.—Incidence of Positive Answers to Questions 1 and 2* from Data Obtained in Survey of 1956-57 Using Form Questionnaire of Department of Health, Education, and Welfare

Disease	No. of Students with Disease	No. with Disease Who Said They Had Also Had Rheumatic Fever	Per Cent
Inflammatory rheumatism	1	1	100.0
Scarlet fever	117	4	3.4
St. Vitus' dance (chorea).....	1	1	100.0
Joint pains and swelling.....	34	11	32.4
Leakage of heart valve(s) (heart murmur)	84	20	23.8
No. of different students with above diseases†.....	219†	27†	12.3
No. without any of above diseases	2040	18	0.9
Total students	2259	45	2.0

* (1) Have you ever had (a) inflammatory rheumatism, (b) scarlet fever, (c) St. Vitus' dance (chorea), (d) joint pain and swelling, (e) leakage of heart valves (murmur)? (2) Have you ever been told by a physician you had rheumatic fever?

†Some of the students had had more than one of the diseases listed; hence there were fewer students than cases of the diseases.

had had the disease was 2.0 per cent. (It may be noted that questioning by the cardiologist revealed a convincing symptomatic history of rheumatic fever in only six persons.) Rheumatic heart disease was diagnosed in five of the total of 2,259 persons; one of the five had answered "no" to the question about whether he had been told he had had rheumatic fever. The incidence of rheumatic heart disease diagnosable at the time of entry was therefore 0.22 per cent in this group of 2,259 entering freshmen. Two students were diagnosed to have congenital heart disease, or roughly 0.09 per cent.

Survey of all entering students registering for the fall semester of 1949 and fall semester of 1950

The author previously reported a survey of all entering students registering for the fall semester of 1949 and fall semester of 1950 which was much more complete and detailed than the two surveys presented above.^{1,2} In that survey all students whose health record card showed any history suggestive of heart disease, or in which there was a notation on entrance physical examination or elsewhere of the presence of a heart murmur, of cardiac arrhythmia or of abnormal blood pressure, were called for reexamination and evaluation by the cardiologist. The author saw each such person at least once in order to arrive at a definitive diagnosis wherever possible. As previously mentioned, the Criteria for Diagnosis of Diseases of the Heart adopted by the American Heart Association was closely applied.

In this study, the entire group surveyed comprised 11,096 students, of whom 7,566 (68.2 per cent) were males and 3,530 (31.8 per cent) were

TABLE 2.—Comparison of Data Obtained in Three Surveys of Incidence of History of Rheumatic Fever in College Students as Related to Actual Presence of Diagnosable Rheumatic Heart Disease

Survey	No. in Survey	Giving History of Rheumatic Fever		Diagnosable Rheumatic Heart Disease		Diagnosable Congenital Heart Disease	
		No.	Per Cent	No.	Per Cent	No.	Per Cent
1949 and 1950.....	11,096	.....	.....	30	0.27	12	0.11
1954.....	14,898	259	1.74	.....	.....	.....	.....
1956-57.....	2,259	45	2.0	5	0.22	2	0.09
Total.....	28,253	....	2.0	....	.....	....	.....

females. (The high proportion of males in this survey was due in part to the large number of persons attending college after service in World War II.) Of this number, 378 were evaluated by the cardiologist for the reasons given above. Thirty students (0.27 per cent) were diagnosed as having rheumatic heart disease, 12 (0.11 per cent) as having congenital heart disease, and 26 (0.23 per cent) as having "possible heart disease." No record was made in this survey as to how many of the 11,096 students in the group had been told previously by a physician that they had had rheumatic fever; therefore this information is not available.

DISCUSSION

These three independent surveys, carried out at widely different times on different populations at the same University, and each seeking somewhat different data, encompass a student population of 28,253. They appear to show surprisingly close agreement in comparable data related to rheumatic fever, as is readily noted in Table 2. It would appear (from the surveys of 1954 and of 1956-57) that in such a student population some 2 per cent readily recall having been told that they had had rheumatic fever. A much larger proportion had a history of one of the conditions commonly considered to be rheumatic manifestations (survey of 1956-57). Approximately 0.35 per cent had diagnosable heart disease (surveys of 1956-57 and of 1949 and 1950). The incidence of diagnosable rheumatic heart disease approximated 0.25 per cent; the incidence of congenital heart disease, 0.1 per cent.

It is noteworthy that only about one in nine of the students who said they had been told by a physician at one time or another that they had rheumatic fever, had diagnosable rheumatic heart disease upon entering college. Of the total number of those giving a history of inflammatory rheumatism, Saint Vitus' dance (chorea), joint pains and swelling or leakage of the heart valve(s) (heart murmur), about one in 24 had diagnosable rheumatic heart disease on entering college. It is apparent that the student's historical knowledge of having had rheumatic fever or one of its common manifestations is of very limited value as evidence of rheumatic heart disease.

Of course the eliciting of a convincing history of rheumatic fever, particularly of migratory polyarthritis with fever from the student's own recollection of the illness is much more reliable; but, as was noted in the 1956-57 survey, such information was obtainable from only six of the total large number of students giving positive answers to the questions regarding a history of rheumatic fever or one of its common manifestations. Possible conclusions are either that rheumatic fever, as diagnosed by physicians, is a more benign disease than it is usually considered to be or that perhaps rheumatic fever is being diagnosed upon insufficient grounds. Of course, it is possible that an appreciable number of students who were so diagnosed in the past, did indeed have rheumatic fever or rheumatic heart disease and the diagnostic murmurs had regressed and the changes had become so slight they were no longer detectable by clinical, electrocardiographic or radiologic means. Such a possibility is strongly suggested by a recent report of Wilson and Lim⁴ dealing with "The Natural History of Rheumatic Heart Disease in the Third, Fourth and Fifth Decades of Life." Reporting on 757 of 1,042 rheumatic children under observation during the years 1916 to 1956 who had reached the age of 20 years or more, Wilson and Lim noted that in about 50 per cent of the patients residual cardiac damage had been characterized by mitral insufficiency and moderate cardiac enlargement, and that in two thirds of patients with these characteristics the auscultatory murmurs regressed and cardiac chamber enlargement "would not have been recognized on physical examination or by the usual radiographic examination limited to the posterior-anterior view." The author suspects that for most cases this last statement might be broadened to include all the usual cardiac views and an electrocardiogram. But even with this allowance, one must conclude that the incidence of diagnosable rheumatic heart disease in the college population studied herein is less than should be expected on the basis of the number who had history of rheumatic fever. In these days of long-term prophylaxis for persons in whom rheumatic fever has been diagnosed, not to mention the very practical matter of life insurance eligibility, it is most important to make the diagnosis of rheu-

matic fever only on the basis of sufficient positive criteria such as those that were so well worked out by the late T. Duckett Jones.³ In these criteria, the presence of carditis is preeminent, for basically the presence of cardiac involvement is the only important reason for making the diagnosis at all. Penicillin or other prophylactic procedures of long-term nature are not indicated unless the diagnostic criteria for rheumatic fever are clearly met or unless rheumatic heart involvement is definitely present.

2628 Telegraph Avenue, Berkeley 4.

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